

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)	
)	
Unlicensed Use of the 6 GHz Band)	ET Docket No. 18-295
)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz)	GN Docket No. 17-183
)	
 To: The Commission		
Via: ECFS		

**COMMENTS OF THE SOCIETY OF BROADCAST ENGINEERS,
INCORPORATED**

The Society of Broadcast Engineers, Incorporated (“SBE”)¹ by counsel and pursuant to Section 1.415 of the Commission’s Rules (47 C.F.R. §1.415) hereby respectfully submits these Comments in response to the *Notice of Proposed Rule Making*, FCC 18-147, 83 Fed. Reg. 64506 *et seq.*, released October 24, 2018² (the “Notice”). The *Notice* seeks comment on, among other things, a proposal to permit high-power, unlicensed broadband devices to operate indoors in the so-called U-NII-6 and U-NII-8 bands, i.e. 6425-6525 MHz and 6875-7125 MHz. The compatibility of these unlicensed devices, operating at the parameters proposed, with incumbent Part 74 broadcast auxiliary (BAS) stations; Part 101 Local Television Transmission Service (LTTS) licensees; and Part 78 Cable Television Relay Service (CARS) licensees is not adequately addressed in the Notice in this proceeding. Nor does the Commission have sufficient information about the potential aggregate effect of the proposed, unlicensed broadband devices

¹ SBE is the national association of broadcast engineers and technical communications professionals, with more than 5,000 members worldwide.

² The Notice was published in the Federal Register on July 2, 2015. That publication of the Notice specified a comment date of February 15, 2019. Therefore, these comments are timely filed.

on the incumbent users in the U-NII-6 and U-NII-8 bands. SBE has grave doubts about such compatibility, and urges the Commission to defer the addition of unlicensed devices in either of the two BAS bands, pending the development and fair evaluation of compatibility studies. In the interest of broadcasters, video producers, cablecasters and other active mobile users of the band 6425-6525 MHz (the “6.5 GHz BAS band”) and the mobile and fixed users of the band 6875-7125 MHz (the “7 GHz BAS band”) in avoiding preclusive interference to ongoing video production and broadcast electronic news gathering in that band, SBE states as follows:

1. The 6.5 GHz BAS band is very heavily used by broadcasters on a mobile basis, daily, in virtually all broadcast markets for electronic news gathering, and for various aspects of event video production. It is used for a number of other purposes, including portable camera relays to “jumbotrons” screens for major sporting events at stadiums and arenas, and at musical concerts at large venues, indoors and outdoors. It is used for video relay to production trucks at news events, and it is also used for multi-hop mobile relay of video signals from the location of newsworthy events to either a satellite news truck, a fixed receive site or a temporary relay site. The use of this band is unpredictable and the paths, and path lengths, vary hourly. It is difficult to coordinate use of this band with other terrestrial uses. BAS, CARS and LTTS use of this band is not limited to metropolitan areas. It is used for terrestrial video relay from remote, rural locations for electronic news gathering. There are also aeronautical mobile applications in connection with electronic newsgathering or video production operations from helicopters, but the primary use of the band is for terrestrial video relay from mobile cameras. There are additional terrestrial uses of the band, including as noted above video relay to video screens at large event venues, short-range video relay for video production at automobile racing, political conventions and golf events, to name just a few. The National Football League and the NFL Network uses the band

for an in-stadium, low-power, player tracking system as part of its video production operations during televised games. These production venues are in urban, suburban, exurban and rural markets and there is no predictable pattern for geographic area of BAS, CARS or LTTS deployment, indoors or outdoors. Nor can the ENG uses of the band be planned in advance. And the locations of receive sites, some of which are indoors, are entirely unpredictable and itinerant. They cannot be sensed by an unlicensed mobile device before that device transmits.

2. Pursuant to Section 101.147(j) of the Commission's Rules, use of the 6425-6525 MHz segment is limited to use by stations in the mobile service. This band is co-equally shared with mobile stations licensed under Parts 74 and 78 of the Commission's rules. These uses include LTTS (5925-6525 MHz); BAS (6425-6525 MHz) and CARS stations (6425-6525 MHz).³ The 6425-6525 MHz band is allocated to the non-Federal Mobile Service on a primary basis.

3. With respect to the 7 GHz band, fixed and mobile BAS, LTTS and CARS stations are in active daily use in virtually all television markets, and the band is used for both fixed and mobile applications, at indoor and outdoor venues.⁴ BAS licensees actively and intensively use the 7 GHz bands in all markets. That band is used for fixed BAS purposes, which is functionally similar to fixed, point-to-point OFS stations, but it is also used extensively for mobile, TV pickup operation for ENG, in lieu of the terribly overcrowded 2025-2110 MHz ("2 GHz")⁵ band

³ 47 C.F.R. Part 74, Subpart F (BAS); Part 78 (CARS). Use of the 6425-6525 MHz band for direct delivery of video programs to the general public or multi-channel cable distribution is not permitted. Broadcast network-entities may use this band only for mobile television pickup stations. See, 47 C.F.R. §§ 74.602(a) and (i), 78.18(a)(5).

⁴ These applications include television pickup, television studio-to-transmitter links, television relay stations, and CARS stations.

⁵ Now, the overcrowded 2 GHz band is increasingly shared on a co-channel basis with certain facilities of the Department of Defense, putting even more pressure on and an upward migration of broadcast ENG operations to the 6.5 and 7 GHz BAS bands. See, the *Report and Order* in ET Docket No. 13-185, released March 31, 2014 (FCC 14-31, 29 FCC Rcd. 4610). That Report and Order added primary Federal fixed and mobile service allocations to the 2025-2110 MHz band; limited Federal use of the allocation to military use; specified coordination requirements for

and the 2450-2483.5 MHz (“2.5 GHz”) band. Both 2 GHz and 2.5 GHz are used for longer path length BAS TV-pickup type operations, but the 2.5 GHz band is not usable in many markets due to interference from Part 15 high-power unlicensed devices and Part 18 ISM devices.⁶ The 2 GHz band is severely overcrowded in most markets, and the migration into that band of Department of Defense applications, both terrestrial and aeronautical mobile, has resulted in a migration upward by broadcast mobile operations to the 6.5 and 7 GHz bands. There is at 7 GHz both mobile (and temporary fixed) TV pickup operation and there are fixed, temporary relay stations in use for events and electronic news gathering (ENG) operations. BAS fixed facilities and receive sites for temporary fixed facilities are so designated in the Commission’s database, but temporary receive sites do not appear at all. Only relatively recently has the Commission (at SBE’s request) reconfigured its ULS database to allow the registration by BAS licensees of fixed receive sites for TV pickup stations. While these receive sites can now be registered in the database, not all broadcast licensees have completed such registration. That process is ongoing. Therefore, any assumptions that the Commission may have made about the relative occupancy of the 7 GHz band -- in reliance on that ULS database -- are based on inaccurate data. Furthermore, temporary fixed receive sites near news events or any large-scale televised event for relay to fixed receive sites are not going to be found anywhere except in the SBE market coordinator’s

such operations in accordance with a Memorandum of Understanding between Federal and non-Federal fixed and mobile operations; and provided interference protection and priority to the specified non-Federal fixed and mobile operations in the band. It also added footnote US92. The purpose of this allocation was to accommodate the auction of the AWS-3 band at 1755 - 1780 MHz.

⁶ There are numerous incumbent services in the 2450-2500 MHz band. These services include Part 74 Broadcast Auxiliary Service (BAS); Parts 90 and 101 fixed and mobile service stations (2450-2483.5 MHz), including Local Television Transmission Service which operates ubiquitously from temporary fixed locations; MSS stations (2483.5-2500 MHz for satellite-to-user downlinks); Part 27 Broadband Radio Service (2496-2500 MHz); and grandfathered Part 74 BAS and Parts 90 and 101 fixed and mobile stations (2483.5-2500 MHz). In addition, Part 18 of the Commission’s rules authorizes unlicensed industrial, scientific, and medical (ISM) devices to operate in the 2400-2500 MHz band. Finally, Part 15 devices operate up to 2483.5 MHz. Noteworthy among these are Bluetooth devices which operate between 2400 and 2480 MHz. There is also a plethora of Federal government assignments in the band 2450-2495 MHz.

database, which is updated in real time. Those receive sites would be invisible to mobile broadband devices. They are also invisible to the Commission, apparently. The Notice in this proceeding states, at paragraph 74, that only 2% of the BAS operation at 7 GHz is mobile. That is untrue. There is an exceptionally large amount of mobile operation that is done regularly pursuant to Section 74.24 of the Commission's Rules, which permits temporary, short-term BAS operation precisely to accommodate ENG operation. In large markets, the band is several licensees deep on each channel at 7 GHz for ENG operations due to overcrowding of the 2 GHz and 2.5 GHz bands.

4. In both the 6.5 and 7 GHz bands and in the entirety of 5.925-7.125 GHz, there are Ultra-Wideband (UWB) devices operating pursuant to Part 15, Subpart F. These devices, authorized principally by Section 15.250, include UWB wireless microphones in use for video and audio production by broadcasters. The Commission has made inadequate provision for narrower-bandwidth wireless microphones after the auction of the 700 and 600 MHz bands and the resultant TV band repacking in the 470-608 MHz band. One solution for broadcast-quality wireless microphones are UWB devices operating in the U-NII bands. Overlay of wireless broadband devices in the segment will doubtless interfere with these products and reduce their reliability for broadcast use.

5. There are numerous obstacles to the addition of unlicensed broadband devices in the 6.5 and 7 GHz bands. One is the proposed power level, which is far too high for indoor applications. Another is that there is a complete absence of any duty cycle limitation in the proposed rules. A third is that there are insufficient out-of-band emission limits proposed. And a fourth is that, as mentioned above, there is no possibility that unlicensed broadband mobile devices can sense a temporary receive location in a stadium or other indoor location. Nor is the

proposed indoor application requirement for U-NII-6 and -8 devices enforceable at all. The bottom line with any unlicensed device is that if unauthorized deployment or unauthorized device configuration cannot be addressed prior to the point of sale, the rule is not enforceable at all *post hoc*.

6. The Notice in this proceeding assumes that there is no difference in interference potential to incumbent services from a single unlicensed broadband device in the band versus the aggregate interference potential from millions of these devices. The only citation of authority for that premise, however is the RKF study,⁷ the methodology of which has never been explained. SBE urges the Commission to make no assumptions about aggregate interference from millions of unlicensed devices. Furthermore, even if the RKF study's unsupported conclusions about aggregate interference are correct, it is notable that the study based its conclusions on a duty cycle of each unlicensed mobile transmitter of 0.5% (over an unspecified period of time) and the Commission's proposed rules permit a continuous duty cycle at full power output. If the record cannot support a conclusion that, given the rules proposed, the interference potential from one device and that from a million devices in the same environment are exactly the same, then the Commission has no business enacting the rules as proposed.

7. The simple fact is that the Commission has no idea at all what the RF noise floor is in the 5.925-7.125 GHz band, in any environment. Commission staff acknowledged this as long ago as 1999:

The regulatory limitations the Commission places on intentional and unintentional emissions are premised on long-standing assumptions about the relevant ambient environmental noise. Given the dated nature of the Commission's knowledge underlying those assumptions, as new and innovative radio communications devices emerge it is becoming increasingly important that the Commission base

⁷ See, Apple, Inc., Broadcom Corporation, et al. January 25, 2018 *ex parte*.

its decisions on a reliable assessment of the noise floor within the United States and its territories. In examining technical limitations, the Commission must determine whether certain restrictive limitations should be relaxed because the incremental noise contribution is insufficient to justify the economic and innovation burdens associated with the restrictions or whether certain limitations should be continued or even increased because the incremental noise increase could impair the efficacy of existing systems. As we head into the next millennium and the Commission grapples with new and innovative communications technologies, it is essential that the Commission better understand the state of the current noise floor, and the impact of radio emissions on the efficacy of telecommunications systems.⁸

But the Commission has not studied the noise floor or the aggregate effect on ambient noise levels since that time. The Commission's Technological Advisory Council (TAC) proposed to study ambient noise levels, and the Commission solicited and obtained a complete record on the means by which the study would be conducted. However, *sub silencio*, the TAC was disinclined from studying ambient noise and the result is the assumption inherent in the notice in this proceeding that there will be in essence no aggregate effect of millions of unlicensed, high-power mobile broadband devices in the band at issue. That is indeed counterintuitive, but worse, it is "flying blind". The Commission gets but one bite at the apple here: once the unlicensed mobile broadband devices are in the possession of consumers, they cannot be regulated thereafter. Nor can they be regulated in indoor venues such as football stadiums, arenas, and other event venues where ENG and video production is ongoing.

8. The TAC concluded in 1999 that it would be impossible for the Commission to engage in effective spectrum management until it "develop[s] a more complete understanding of the current state of the radio noise environment..."⁹ Thus, the TAC urged the Commission to immediately undertake a multi-part study of the noise floor that would include a detailed analysis

⁸ *Official Requests from the Commission to the Technological Advisory Council, Memorandum of Requests No.1 (May 26, 1999)* at p.3.

⁹ FCC Technological Advisory Council, Second Meeting Report at 1, 9 (Oct. 28, 1999).

of available noise floor literature, the creation of detailed noise floor models, performance simulations, and verification of the simulations.¹⁰ The TAC cautioned against implementing new spectrum management techniques or services *without first concluding extensive studies of the noise floor*. It stated that there:

...could be a very serious emerging problem caused by the explosive growth of both intentional and unintentional radio sources. The future could be very different from what we might expect from past experience. The key to getting our hands around this issue will be a good set of models for both intentional and unintentional radiators which can then be used to predict the evolution of the noise background...¹¹

Further:

[W]e could potentially be entering a period of rapid degradation of the noise environment. Such degradation would reduce our ability to meet the communications needs of the country. The principal negative impacts are likely to be reductions in the performance or reliability of wireless systems or increases in their costs.¹²

The TAC later noted that, until noise floor information is organized and analyzed, the Commission will not have a firm basis for deciding whether current noise standards are too tight, too loose, or appropriate.¹³ *Yet, eighteen years later, no such study has been conducted.* Now, new noise sources are being developed and have been developed and the lack of definitive answers about the effect of aggregate mobile broadband devices in the 6 GHz band is revealed as a serious gap in the justification for the implementation of these devices.

9. Just as the Commission proceeded cautiously initially in the authorization of UWB devices under Part 15, the Commission should proceed cautiously now in authorizing unlicensed mobile broadband devices in the 6 GHz band until experience is gained and the interference

¹⁰ FCC Technological Advisory Council II, Second Meeting Report, at 8-9 (Nov. 23, 2001)

¹¹ FCC Technological Advisory Council, Third Meeting Report, at 1 (Jan. 3, 2000).

¹² FCC Technological Advisory Council, Fourth Meeting Report, at 23 (Annex 4) (Mar. 24, 2000).

¹³ FCC Technological Advisory Council, Sixth Meeting Report, at 9 (Sept. 27, 2000) (discussing Abstract presented by George H. Hagn).

potential is known. Otherwise, individually and in the aggregate, the devices may (and SBE believes that they will) negatively impact the overall electromagnetic noise environment in a band critical to broadcast ENG and video production throughout the United States. Because the Commission's resources are woefully inadequate to address RF noise and Part 15 device interference through widespread enforcement of Part 15 rules governing RF emitters after the devices are deployed, the only reasonable means of dealing with them is to enact and enforce, *ex ante*, appropriate rules for RF emitters that are based on actual knowledge of the noise floor and trends over time. Because mobile BAS operates at unpredictable locations (because all ENG and even many planned events require news coverage at unpredictable locations and times, and use unpredictable paths, indoors and outdoors) those BAS station receive sites will suffer interference from the mobile broadband facilities and there will be no good way to address it in real time.

10. SBE has "something to say" about this proceeding because it has for more than forty years actively sponsored and conducted a very efficient, local market-based frequency coordination program involving broadcast auxiliary spectrum. It is aimed not only at BAS and CARS users, but all users of shared spectrum, including LTTS, POFS, fixed wireless and Part 90 licensees. It includes frequency coordination of the 6.5 and 7 GHz bands. The program has been an unqualified success, notwithstanding the fact that it is not a mandatory procedure and the broadcast engineers who work to ensure maximum spectrum efficiency in shared BAS spectrum do so as volunteers for the benefit of all shared band users. The reason that the program has worked so well is because all licensees in BAS allocations in each market are accommodated. The allocations are in most markets far too small to accommodate all real-time users of the spectrum. However, as a matter of policy and intent, mobile (including temporary fixed), fixed,

and out-of-market users operating in a given broadcast market are accommodated. The real-time and near-real-time procedures and coordination mechanisms used by SBE coordinators in their local markets include not only time slot sharing, but other technical procedures such as cross-polarization of antennas that are not possible using only Commission interference protection mechanisms used in licensing. The addition of unlicensed RF devices into these bands makes the RF environment uncontrolled, whereas it is quite controlled now, both intra-service and inter-service.

11. Based on the concerns above, SBE has some specific suggestions that will allow the Commission to satisfy its obligations pursuant to the FY 2018 omnibus spending bill, which includes the MOBILE NOW Act under Title VI of RAY BAUM’S Act.¹⁴ First of all, the Commission should proceed cautiously (as it did with UWB sixteen years ago) by making available only the band 5.925-6.100 GHz for unlicensed mobile broadband use. This will more than satisfy the Commission’s obligation under the MOBILE NOW Act. That legislation, at Section 603(a)(1) of the MOBILE NOW Act requires that no later than December 31, 2022, the Secretary of Commerce, working through NTIA, and the Commission “shall identify a total of at least 255 megahertz of Federal and non-Federal spectrum for mobile and fixed wireless broadband use.”¹⁵ Of this amount, at least “100 megahertz below the frequency of 8000 megahertz shall be identified for use on an unlicensed basis”; at least “100 megahertz below the frequency of 6000 megahertz shall be identified for use on an exclusive, licensed basis for commercial mobile use,” subject to certain conditions; and at least “55 megahertz below the frequency of 8000 megahertz shall be identified for use on either a licensed or unlicensed basis,

¹⁴ See Consolidated Appropriations Act, 2018, P.L. 115-141, Division P, the Repack Airwaves Yielding Better Access for Users of Modern Services (RAY BAUM’S) Act. Title VI of RAY BAUM’S Act is the Making Opportunities for Broadband Investment and Limiting Excessive and Needless Obstacles to Wireless Act or MOBILE NOW Act. *Id.*

¹⁵ *Id.* § 603(a)(1).

or a combination of licensed and unlicensed.”¹⁶ Given these parameters, the Commission would be in full compliance with the legislative obligation if it made available 5925-6100 MHz for unlicensed mobile broadband. This more than satisfies the 100 MHz unlicensed requirement and the 55 MHz unlicensed requirement of the MOBILE NOW Act, and it obviates the adverse interaction between BAS, LTTS and CARS operation at 6425-6525 MHz and 6875-7125 MHz.

12. The Commission should proceed cautiously with respect to the proposed power level and other operating parameters as well. Lower power contributes to frequency re-use and added compatibility. The proposed limit of 250 milliwatts for access points in the 6.5 and 7 GHz bands is far too high. Moreover, there should be a duty cycle limit of 0.5% over a period of one second. The 0.5% limit was the assumption made in the RKF study and it was a key element of the conclusions reached in that study. If the Commission is going to rely on the RKF study for any purpose whatsoever, it is obligated to utilize the limited duty cycle proposed in that study. Finally, the out-of-band emission mask proposed in the Notice is unacceptably lax. The Notice proposal for an OOB limit is -27 dBm/MHz. For comparison purposes, the intentional emitter limit for UWB devices in this same band is -41.3dBm/MHz. SBE suggests that an OOB limit that would be achievable and reasonable in the 6 GHz band is -61 dBm/MHz. That limit would encourage spectrum efficiency and frequency re-use.

13. Finally, indoor operation of these devices calls for a more reliable means of ensuring against interference to receive locations than is proposed in the Notice. SBE suggests the use of registered beacon fence devices. These would allow commercial users to transmit a signal that informs access points in their fence area, so that they will not transmit or allow transmission. This is especially urgent in football and other sports stadiums, performance arenas, and other

¹⁶ *Id.* § 603(a)(2).

areas to preclude interference to ongoing entertainment productions and video production at indoor news events. A registered beacon device transmits via already used control frequencies. The technology must be required in 6 GHz unlicensed mobile broadband devices to prevent them from transmitting if the beacon signal is received. There is no other reliable method of protecting the RF environment inside event forums for incumbent uses, especially broadcast ENG.

14. In summary, it is not necessary to authorize unlicensed mobile broadband devices to operate in the bands 6425-6525 MHz or 6875-7125 MHz and the Commission should refrain from doing so. The Commission should proceed cautiously in view of its complete lack of information about the aggregate effect of these unlicensed mobile broadband devices on ambient noise in the band. The proposed power levels, out-of-band emission levels and the absence of a duty cycle limitation combine to provide a potentially severe disruption of ongoing, critical electronic news gathering and video production efforts, mobile and fixed, indoor and outdoor, that cannot be remedied once authorized. There is but one chance to get this right and the model that the Commission employed sixteen years ago in authorizing unlicensed UWB operation should be followed in this instance. The Commission should proceed with the Notice proposal only in the segment below 6.1 GHz, (or in any case below 6.425 GHz) and it should only do so with the duty cycle limitations, reduced maximum power levels and significantly reduced out-of-band emissions suggested herein. The Commission's longstanding policy with respect to Part 15 devices is that it will not authorize such if there is a significant potential for interference to either licensed radio services in allocated bands, or to pre-existing, incumbent unlicensed devices and systems operating in accordance with the Part 15 rules. Here, the interference potential to ENG and other BAS, LTTS or CARS receive locations is unacceptably high and until further

experience is gained, the deployment of unlicensed mobile broadband systems should be substantially limited.

Therefore, given the foregoing, the Society of Broadcast Engineers respectfully requests that the Commission refrain from authorizing unlicensed mobile broadband devices or access points in the 6425-6525 MHz band or the 6875-7125 MHz band at this time.

Respectfully submitted,

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